Book Reviews

Molecular Mechanisms in Striated Muscle. By S. V. PERRY. (Pp. x + 168; illustrated in colour and black & white; £35/$59.95 hardback, £12.95/$19.95 paperback; ISBN 0 521 57001 8 hardback, 0 521 57916 3 paperback.) Cambridge: Cambridge University Press. 1996.

This short book is a summary of lectures Professor Perry gave under the auspices of the Accademia Nazionale dei Lincei sponsored by the IBM Foundation of Italy. Professor Perry FRS is regarded as one of the fathers of muscle biochemistry. In particular he is an authority on activation/contraction coupling of skeletal muscles with particular reference to the regulatory proteins. These undergo a transformational change to expose the active sites on the thin filaments so that the myosin crossbridges can engage and generate force. Much of the book is concerned with the way in which the myosin molecular motors generate force. However, the 1st chapter deals with general aspects of motile systems and compares and contrasts the actin-based motor protein systems with the tubulin-based motor protein systems in eukaryotes. Cell motility in procaryotes is only briefly mentioned with a brief reference to the rotary motors in flagella.

Elucidation of the structure of the head (S1) of the myosin crossbridges by x-ray diffraction and the previous knowledge of the structure of the thin (actin) filament has made it possible to postulate mechanisms involved in the steps in the crossbridge cycle. As mentioned, much of the book (Chapters 3, 4 and 5) is concerned with the switching on and switching off of the myofibrillar system; the last chapter (6) is devoted to a description of Duchenne muscular dystrophy and the generalised structure of dystrophin (the protein that is missing in this form of muscular dystrophy). This is based on work published in 1991 and is therefore somewhat out-of-date. For example, dystrophin is no longer thought to be a double molecule. Also it does not fit in with the general theme of the book because as yet no mechanism or role has been assigned to dystrophin except insofar as it is a cytoskeletal protein that reinforces the membrane.

Muscle is a mechanical tissue and for the morphologist there is insufficient detail of the structural aspects of contraction. For example there has been some recent work which uses ultrahigh resolution electronmicroscopy to look at the myosin crossbridges in muscle frozen at different stages of contraction. The structure of the sarcoplasmic reticulum and T tubule systems is, however, very informative. The molecular structure of the myosin crossbridge head (S1) is of considerable interest as is the discussion of the nonmuscle myosins and the variations found between the different classes of myosin, e.g. some exist as just single S1 heads, others have 2 heads but no rods, and others (including the conventional muscle myosins) consist of double structures with 2 heads and 2 rods. At the present time there are about 12 classes of myosins of which only class II are the conventional or muscle myosins. The existence of these myosin molecular motors in many cell types emphasises the universality of these molecular motors.

The book is reasonably priced and it is an easy-to-read description of our present-day knowledge of how skeletal muscle works. Therefore it could be recommended reading for science students specialising in physiology or medical and veterinary students pursuing special option courses in musculoskeletal biology. It is certainly a book that should be purchased by most university libraries.

G. GOLDSPINK

Life's Splendid Drama. By PETER J. BOWLER. (Pp. xiii + 525; some figures; £30.25 hardback; ISBN 0 226 06921 4.) Chicago: University of Chicago Press. 1996.

The notion of evolution, that is descent through modification, is now so well established as an explanation for the diversity of contemporary and fossil life forms that it is easy to forget that it has its own history. The concept of evolution predated Darwin, and it grew out of the science of comparative anatomy. It was the polymath Goethe who coined the term 'morphology' to describe the scientific study of form which underpins comparative anatomy.

Until the discovery of the genetic code, which provided the wherewithal to use the genome to determine the nature of evolutionary relationships, biologists were forced to use evidence from the phenotype to infer evolutionary history. Investigators soon realised that the phenotype could not be relied upon to reconstruct relationships for it became evident that the 'same' morphology could emerge in more than one lineage. This phenomenon, that similar morphology could be inherited from different ancestors, was referred to as 'homoplasy' by Ray Lankester as long ago as 1870. The discovery of proteins, and thereafter of the way that they are constructed from amino acids, allowed morphologists to pursue their search for relationships using the methods of biochemistry rather than those of the dissection laboratory. Thus was born the discipline of biochemical morphology, or molecular evolution. The facility and ability to amplify and sequence DNA has wrought an even more radical transformation in evolutionary biology, for relationships can now be assessed at the level of the genome itself. This is proving to be a not altogether straightforward process, for the nature of DNA is such that it is not all as informative about evolutionary relationships as had been anticipated.

This brief history of the search for ways to recover evolutionary relationships might be interpreted as suggesting that DNA sequencing has displaced the more traditional methods of the morphological sciences. This is true to the extent that the former is proving more reliable than the latter for the reconstruction of evolutionary relationships, but for information about adaptation and functional interpretations we continue to depend on inferences based on traditional morphology.

Peter Bowler is a student of the history and philosophy of science with a particular interest in evolution in general, and in the influence of Darwinism in particular. In this book he explores the contribution that morphological science has made to evolutionary biology. In doing so he tries to put to rest the perception that morphologists have obstructed rather than facilitated the task of evolutionary biologists. He limits himself to zoology, but within that constraint he ranges widely to consider invertebrates as well as vertebrates, although he concentrates on the origins of the vertebrates, amphibians, birds and mammals.

The standard of scholarship and diligence in this book is high. It exposed the extent of my ignorance about the history of ideas about homoplasy and homology. I especially appreciated discovering that the basic tenets of cladistics, which are now almost universally associated with Willi Hennig, had been anticipated by Peter Chalmers Mitchell, a former Secretary of the Zoological Society of London, in a 1905 paper on the morphology of the intestinal tract of mammals. For some time it was known as 'Mitchell's theorem' until the link with Mitchell was forgotten.

I fully expect that it is a sign of advancing years that I have begun to be unreasonably irritated when the writers of articles fail to acknowledge, by appropriate references, the historical roots of the topic they are investigating. Peter Bowler has ensured that none of us has any excuse for neglecting the historical antecedents of comparative anatomy. Books like this one should be widely read and marked, but I fear that few people feel they have the time to explore the history of their subject. Peter Bowler has provided morphologists with a fine history of their subject and I urge them to take advantage of his labours and scholarship. All of us would profit if we found the time to delve into this admirable account of the ways that comparative anatomy has improved our understanding of evolutionary history.

BERNARD WOOD

The Rat Brain in Stereotaxic Coordinates, 3rd edn. By GEORGE PAXINOS and CHARLES WATSON. (Pp. xxxiii + 80; illustrated; £$69.95 paperback; ISBN 0 12 547623; comes with CD-ROM.) San Diego: Academic Press. 1996.

The new and thoroughly revised 3rd edition of Paxinos & Watson's rat brain atlas has three outstanding advantages, each of which is an impelling reason to buy it. The first reason is slipped into a plastic envelope on the inside of the back-cover—a CD-ROM, for Macintosh, PC or Unix, containing all the 76 updated drawings of the rat brain as well as a 22 levels of the spinal cord from Molander & Grant (1995); any of these can be downloaded, adapted or included into standard graphic-files for personal use. I think this is the first electronic atlas to be brought out, and it is excellent. The second advantage is that the nomenclature of the nuclei and cell groups in the brain is really up-to-date, and includes all manner of new subdivisions—not only those outlined by the usual Nissl and acetylcholinesterase stains, but also calbindin, parvalbumin, the neurofilament protein SMI-32, and a multitude of other enzyme-based stains. The third reason for procuring this atlas is that it is a convenient and compact size.

The new concise 'Paxinos & Watson' is in no way a replacement for the old edition. It would be more accurate to call it an 'essential supplement' or 'update', because it contains no photographic plates, only drawings (which, when used alone, our students found a distinct handicap for section identification), and there are no sagittal or horizontal sections either.

The reader is informed that the next (4th) edition will be a comprehensive one. Some of the changes that one could wish for in it are an expansion of the text and references, and the addition of the page-location to the 'List of Structures'. At present to find, for example the facial nucleus, you must first look it up in the List of Structures to find the abbreviation, then under 'Abbreviations' to find the pages where facial nucleus occurs. A useful addition to the CD-ROM might be the facility to call up the name of a structure when it is 'clicked' by the mouse. With any luck some of these wishes will be granted in the forthcoming edition.

But I strongly recommend the acquisition of this compact, updated, set of electronic drawings of the rat brain to every laboratory, not only just to supplement the old edition, but in its own right. I found it extremely helpful, and it adds yet another dimension to this famous atlas.

JEAN BÜTTNER-ENNEVER

The Anatomy and Physiology of the Mammalian Larynx. By D. F. N. HARRISON. (Pp. xii + 288; illustrated; £45/$74.95 hardback; ISBN 0 521 45321 6.) Cambridge: Cambridge University Press. 1995.

For the student with more than a passing interest in the comparative anatomy and physiology of the larynx, the first step towards education and edification has been to read Victor Negus' 1929 classic *The Mechanism of the Larynx*. Working in the Royal College of Surgeons with their collection, and material from the Zoological Society, Negus' goal was 'to describe the origin of the most simple organ, and to add on piece by piece a consideration of the modifications demanded by complication of life in the animal kingdom'. By rejecting the then prevailing wisdom that the larynx was essentially an organ for sound production and focusing on general mechanisms that were evident in all vertebrate species, Negus laid the foundation of all modern concepts regarding laryngeal functions and their adaptive origins. In the preface to his book, *The Anatomy and Physiology of the Mammalian Larynx*, Professor Sir Donald Harrison pays tribute to the inspiration he has gained from Negus' book, and sets out his goal as extending that work through the application of modern techniques and an analysis of a wider range of animals. To this end he has amassed 1410 laryngeal specimens covering some 253 mammalian species, most of which have been serially sectioned. This very impressive collection of material forms the framework around which the 6 chapters constituting this book are woven.

The introductory chapter is a brief history of comparative anatomy in general though not an exhaustive historical survey of the study of laryngeal anatomy and physiology as might have been expected. Still, early contributions are discussed and the subsequent chapters do contain additional historical material related to specific aspects of laryngeal anatomy. Surprisingly, apart from a brief biography, there is no description or critical evaluation of Negus' contributions. This is most puzzling for a book that is intended to be a modern extension of Negus' work. In fact, one would be hard pushed to find much more than the occasional brief reference to Negus' two major works anywhere in this book. Given the limited literature available on comparative laryngology, it is perhaps not too unreasonable for Professor Harrison to assume that his intended readership is familiar with Negus' works and their significance. But the absence here of a critical synopsis of Negus' conclusions and a sense of what Professor Harrison feels his new material and analysis can add to our understanding of the larynx will leave both the specialist and general reader without a clear sense of the purpose and direction of the remainder of the book.

The next chapter, which deals with specimen and data collection, could very easily have been shortened and relegated to an appendix, and the illustrations of the

'custom-designed punch card' and 'equipment used to reconstruct bat larynges' dispensed with. A reader knowing the analytical power of computers equipped with sophisticated data collection and 3-D imaging software might have difficulty taking seriously the author's intention of applying *modern* techniques to the study of the larynx after viewing these figures.

The next 3 chapters deal in detail with laryngeal anatomy and physiology from a comparative perspective and are the best part of the book. In themselves, these are all very well written and informative and for the most part constitute a fairly comprehensive, if somewhat superficial, review of recent work. One might quibble, for example, at the lack of discussion of the relationship of the larynx to the pharynx, or the rather cursory treatment of the fibrous components of the larynx (notable absentees include the quadrangular membrane), but there are excellent reviews of the nerve supply of the larynx and laryngeal morphology in terms of respiratory physiology and metabolism. The real problem with these chapters is that they lead nowhere. Unlike Negus, who organised his work from the perspective of why animals, larynges are the way they are, Harrison focuses almost exclusively on what is there, and then in a rather fragmentary way. Harrison's eschewal of Negus' teleological approach—clearly shown by the almost complete absence of any discussion of Negus' findings—heavily detracts from the usefulness of the material covered in these chapters.

A further detraction from these chapters is the illustrative material. Most of the illustrations are of laryngeal sections (or parts thereof) and, for the most part, these are unlabelled. Orientation in some specimens is difficult to assess because of excessive trimming of the prints. For example, Fig. 4.9 on page 68 purports to show a possible fusion between the cricoid and arytenoid cartilages in a sagittal section of a red kangaroo larynx. However, the overtrimming of the print makes it appear that the arrow is pointing to a fusion between cricoid and thyroid cartilages. Orientation and recognition of structures is further complicated by the murky appearance of much of the material, and an unacceptably large proportion of the photographs are out of focus. Perhaps most serious of all is that no attempt has been made—despite the claims in Chapter 2—to convey the 3-D appearance of the larynges of various species (apart from a cardboard model of the cricoid cartilage of a bat) and there are no illustrations allowing the reader to compare various features across species. For all the long-windedness of his text, Negus provided almost 100 drawings of whole or hemi-sectioned larynges, as well as a number of comparative figures. One wonders why Professor Harrison decided to present his impressive collection of material almost solely in the form of photographs of sections.

The final chapter of Professor Harrison's book is entitled 'Evolutionary concepts' and deals almost exclusively with human evolution and the evolution of speech. While this is succinctly presented, the chapter as a whole offers very little in the way of new directions to be explored from the study of comparative anatomy and nothing on what needs to be done now in terms of the comparative anatomy of the larynx.

Overall, Professor Harrison's book does contain much useful information not readily available elsewhere, but it lacks any clear purpose or conclusions. Admittedly, modern science's climate of conservatism and aversion to teleological approaches in biology may have heavily influenced the style and presentation of this book. But with the wealth of anatomical material available to him, and his long experience as a laryngologist and comparative anatomist, Professor Harrison could have created a tour de force in comparative morphology. Sadly, this book does little justice to his impressive collection of specimens or to the pioneering work of Victor Negus.

MARTIN D. CASSELL